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OCT 18 1996

Students First

A Guide for Students

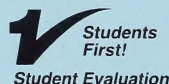
Preparing to Write
the Physics 30
Diploma Examination

Preparing to Write the Physics 30 Diploma Exam

Dear Student:

The authors of this guide are staff from the Student Evaluation Branch. These are the people who actually put together the exam you will be writing. They also organize the marking sessions and train the teachers who mark the exams. These people see first-hand what thousands of students are doing right (and wrong) when they write an exam.

This guide and all other diploma exam-related materials produced by Student Evaluation Branch staff are identified with the logos



I hope you will find this guide helpful. Good luck on exam day!

*Frank Horvath, Director
Student Evaluation Branch*

Getting ready

✓ Start now

The most effective way to prepare to write the Physics 30 Diploma Exam is to start right at the beginning of the course developing your problem solving and laboratory skills. For each topic you study, try to find applications in your daily life and in the technology that surrounds you. Review your notes daily. Research on the “forgetting curve” shows that if you don’t recall, review, or work with what you’ve learned, you will forget 50 to 80% of it within 24 hours.

Take the time to read scientific articles and to relate them to your learning. Although the context may be unfamiliar, the physics is often something you’ve studied. Practise finding the concepts within the context. Get in the habit of carefully rereading your written work to see if it clearly says what you want it to say.

✓ Understand the machine-scored section of the exam

The Physics 30 exam consists of two parts. The first part of the exam is machine scored and consists of 37 multiple-choice questions and 12 numerical-response questions, each with a value of one mark. This part of the exam contains sets of related questions. A set may contain multiple-choice and/or numerical-response questions. In some cases, these items are “linked.” This means that a numerical answer from one question may be needed to complete the calculations in the next question. If you answer the first question incorrectly but correctly use that answer to answer the second question, you will receive full marks for the second question. Ask your teacher to show you examples of this type.

✓ **Understand the written-response section**

The second part of each Physics 30 exam consists of two written-response questions. The first question is a closed-response or analytic question. It is marked by a teacher using a scoring guide that clearly lists the important points required for each mark to be attained. There are ten possible marks for this question.

The other written-response question is an open-response question. This question is designed to allow you to communicate the knowledge, skills, and concepts you have learned in Physics 30. It is marked by two teachers independently. Each marker gives a mark between 0 and 4 for physics content and a mark between 0 and 3 for communication. The communication mark is based on the clarity of your response as well as the appropriate use of conventions when dealing with graphs, formulas, equations, diagrams, significant digits, and units of measurement.

For this question, your total mark is calculated by adding together the two markers' scores for content and then adding the average of the two markers' scores for communication.

e.g.:

	Content	Communication
Marker 1	A/4	C/3
Marker 2	B/4	D/3

$$\text{Total mark: } \frac{A+B}{8} + \frac{\frac{1}{2}(C+D)}{3} = \frac{\text{Total Score}}{11}$$

If the scores of the two markers differ by 2 or more on either scale, a third marker is assigned to read your solution.

Samples of both types of written-response questions and the corresponding scoring guides can be found in the *Physics 30 Information Bulletin, Diploma Examinations Program*.

✓ **Understand the calculator policy**

The Calculator Policy can be found in the *Physics 30 Information Bulletin, Diploma Examinations Program*. Read it carefully. Students are expected to use a scientific calculator when writing diploma examinations in mathematics and science. Calculator memories must be cleared of all stored information except for the formulas that appear on the data tear-out pages or in the data booklets and the programs used for graphing quadratic relations in Math 30/33. It is **your responsibility** to ensure there is no information stored in the calculator you are using except what is specifically allowed by this policy. Failure to do this is a breach of exam procedures and is considered cheating. It is not worth taking a chance. If you are unfamiliar with how to clear calculator memories, talk to your teacher.

✓ **Be familiar with numerical-response formats**

Numerical-response questions have many different forms. Examine the following examples and be sure you are familiar with each type of question.

Use the following information to answer the next question.

Bumper cars operate on electricity. The more the accelerator pedal is pressed, the more current flows in the system, thus the faster the car travels. Car X and car Y are going to collide head-on. Car X is travelling at a constant velocity of 2.25 m/s to the east and car Y is travelling at a constant velocity of 1.30 m/s to the west.

Numerical Response

1. The total mechanical energy of the bumper cars described, expressed in scientific notation, is $b \times 10^w$ J. The value of b is _____. (Round and record your answer to three digits.)

Answer:

Use the following information to answer the next question.

Air pollution can be a serious problem in underground parking garages. The quantity of a particular pollutant in the air can be measured by passing a beam of light through the garage and measuring how much of it is absorbed. The light must have a wavelength that is strongly absorbed by the target pollutant.

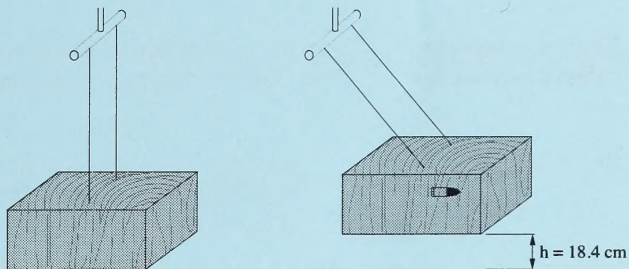
Numerical Response

2. A laser must be designed to supply a wavelength of 164 nm to detect a particular target pollutant. The search for a laser material begins with a list of hydrogen-like atoms/ions. The hydrogen-like atom whose 3-2 transition would emit light at 164 nm would have an E_1 value, expressed in scientific notation, of $-a.b \times 10^{-cd}$ J.

(Round and record your answer as .)

Answer:

Use the following information to answer the next question.



A ballistic pendulum is a device used to measure the speeds of fast moving objects like bullets. It consists of a wooden block with a mass of 1.00 kg.

A bullet with a mass of 5.00 g is fired from a gun with a barrel that is 74.2 cm long. The gun's mass is 2.45 kg. When the bullet strikes the block, it causes the block to rise 18.4 cm.

Numerical Response

3. The speed of the bullet just before it strikes the ballistic pendulum, expressed in scientific notation, is $a.bc \times 10^d$ m/s.

(Round and record your answer as $\boxed{a} \boxed{b} \boxed{c} \boxed{d}.$)

Answer: $\boxed{3} \boxed{8} \boxed{2} \boxed{2}$

Numerical Response

4. Place the following types of EMR in order of increasing energy:

- 1 blue light
- 2 gamma radiation
- 3 radio waves
- 4 ultraviolet radiation

(Record your answer on the answer sheet $\boxed{} \boxed{} \boxed{} \boxed{}.$)

Answer: $\boxed{3} \boxed{1} \boxed{4} \boxed{2}$

What you can do to prepare

- ✓ **Review schedules, rules, and policies**
 - Record the time and place of writing
 - Note minimum and maximum writing times permitted
- ✓ **Review guidelines**
 - Review Guidelines for Significant Digits, Manipulation of Data, and Rounding in the Mathematics and Sciences Diploma Examinations
- ✓ **Prepare a review schedule**
 - Design your schedule for the two-week period (minimum) before the examination
 - Divide the course material into sections and indicate on the schedule the time blocks to be devoted to each section
 - take into account the examination blueprint available from your teacher (*Physics 30 Information Bulletin, Diploma Examinations Program*). Note that course units are not equally weighted on the diploma examination
 - take into account units/concepts that you find most difficult; i.e., allocate more time for the review of these
- ✓ **Review the exam format**
 - Review the format of previous diploma examinations (available from your teacher)
 - Review the meaning of key “science process” words (Appendix A)
 - Review the meanings of key “directing” words (Appendix B)
- ✓ **Make summaries and outlines**
 - Distinguish between major concepts and factual details
 - Identify essential skills that can be assessed on paper and pencil tests
 - Review lab results and procedures—identify connections between lab reports, class notes, and textbook
 - Anticipate examples of connections between concepts and the “real world”
 - Prepare a glossary of important subject terminology
 - Review techniques for graphing scientific data
 - Review the data tear-out pages for Physics 30
 - Link each formula or equation with a calculation done on a previous test or assignment
 - Identify any restriction on the use of each formula or equation
- ✓ **Develop memory aids**
 - Colour code, underline, highlight, jot key words in margins
 - Number points to be memorized
 - Group word and idea associations
 - Read key words aloud, express key words in your own words

How to do your best when writing the exam

- ✓ **Be comfortable**
 - Make yourself comfortable. Wear comfortable clothes, eat well and get plenty of rest.
- ✓ **Be prepared**
 - Arrive a few minutes early and check that you have all necessary supplies (Kleenex, cough drops, pencils, pens, calculators, mathematical instruments, a clear ruler, etc.). A spare calculator is not a bad idea. Make sure you've cleared your calculator memories of all information except what is specifically allowed in the *Calculator Policy*.
- ✓ **Pace yourself**
 - Keep track of the time and pace yourself. Put a mark by items that you are uncertain about and return to them if there is time at the end of the examination.
- ✓ **Answer every question**
 - Do not be afraid to answer each question even if you are not sure of the correct solution to the problem. A penalty is NOT given for guessing on the machine-scored section the exam. Partial marks are often awarded for incomplete answers in the written-response section of the exam.
- ✓ **Record your answers**
 - Record your answers in the test booklet. This will help you in checking your work or if you have a problem with your answer sheet.
- ✓ **Use logical guessing**
 - If you are stuck on a question, mark the alternatives that you know are incorrect and choose from the ones that are left, using logical guessing strategy. Think of the questions as challenges and cultivate a positive attitude about your ability to answer them.
- ✓ **Look over the entire exam**
 - Scan the sets of questions on the examination before answering a particular question. The questions in one set of the examination may jog your memory about a question in another set.
- ✓ **Identify key words**
 - When first reading a multiple-choice question, locate and circle key words to help clarify the meaning of the question. Then, hide the alternatives and try to formulate an answer of your own. Your answer may be very close to the correct alternative.

- ✓ **Do calculations first**
 - If a multiple-choice question involves a calculation, do the calculation and select the alternative that is closest to your answer. A multiple-choice calculation is usually short. If you cannot do it in five minutes, your method is either inappropriate or incorrect. Go on.

- ✓ **Label diagrams**
 - Diagrams on examinations are often labelled with numbers or letters. It may be useful to write the names of the labelled structures or features that you can identify.

- ✓ **Use a clear ruler**
 - When reading graphs, use a clear plastic ruler to more accurately extrapolate or interpolate data.

- ✓ **Don't look for patterns**
 - Have a good reason for changing an answer. Do not change an answer on a hunch. Do not waste your time looking for patterns of As, Bs, Cs, or Ds in multiple-choice answers. There are none.

- ✓ **Prepare an outline**
 - You may not have time to write and edit a complete rough copy for each written-response question, but you should prepare an outline of your answer and use it as a guide when writing your good copy.

- ✓ **Think about what you are telling the marker**
 - When completing a written-response question, keep in mind the reader of your response. The reader will want to know whether you:
 - understand the problem or the mathematical/science concept
 - can correctly use the mathematics involved
 - can use problem-solving strategies and explain your answer and procedures
 - can communicate your solutions and mathematical/science ideas

- ✓ **Rewrite the question**
 - Rewriting a statement of the question is often a good way to begin a written response. Conclude with a summary statement. Be sure you have clearly explained all assumptions and have verified your conclusions.

Additional reminders

✓ Further information

For more detailed information about the Physics 30 diploma examination, ask your teacher about the *Physics 30 Information Bulletin, Diploma Examinations Program*. Each Physics 30 teacher will have a copy.

This bulletin contains a great deal of information about the exam as well as the scoring criteria used by markers to evaluate your written work.

✓ Rescores

You may request a rescoring of your examination if you believe that the mark you have received is not appropriate. Before applying for a rescoring, be sure to check your *Diploma Examination Results Statement* to see what marks you have been awarded on each section of the exam. Your mark on the machine-scored portion is not likely to change, but your written-response mark could change slightly. Keep in mind that if you do request a rescoring, your new mark, whether it increases *or decreases*, will be your final mark. The fee for this service is \$26.75, which include G.S.T. This fee is refunded if your mark changes by more than 5%.

✓ Rewrites

You may rewrite a diploma examination during any regularly scheduled exam period. You must apply to the *Student Evaluation Branch* by November 15 and April 15 to be eligible to write the January and June diploma examinations. The fee for rewriting each exam is \$26.75, which includes G.S.T. (For more details, see the *General Information Bulletin*.)

✓ Other questions

If you have questions about the exam that your teacher can't answer, or if you are a student without a regular classroom teacher, feel free to call

Mrs. Corinne McCabe, Physics 30 Examination Manager

or

Mr. Phill Campbell, Assistant Director, Math/Science Diploma Exams
at 403-427-0010.

To call toll-free from outside of Edmonton, dial 310-0000.

Good Luck!

Appendix A

Science process words

Hypothesis:	A single proposition intended as a possible explanation for an observed phenomenon; e.g., a possible cause for a specific effect
Conclusion:	A proposition that summarizes the extent to which a hypothesis and/or a theory has been supported or contradicted by the evidence
Experiment:	A set of manipulations and/or specific observations of nature that allow the testing of hypotheses and/or generalizations
Variables:	<p>Conditions that can change in an experiment. Variables in experiments are categorized as:</p> <ul style="list-style-type: none">• <i>manipulated variables</i> (independent variables)—conditions that were deliberately changed by the experimenter• <i>controlled variables</i> (fixed or restrained variables)—conditions that could have changed but did not, because of the intervention of the experimenter• <i>responding variables</i> (dependent variables)—conditions that changed in response to the change in the manipulated variables
Technology:	<p>The development of our understanding of science is directly related to the development of technology. The meaning of technology has many facets, but in general, technology refers to a way of doing something. This includes the development of tools and new techniques for solving problems. It also includes ideas and their organization for achieving practical purposes. In the context of an examination question, technology includes both these facets of meaning. That is, a technological explanation should include not only identification and descriptions of equipment (tools, products) but also explanations of procedures.</p>

Appendix B

Directing words

Contrast/Distinguish

Point out the *differences* between two things that have similar or comparable natures

Compare

Examine the character or qualities of two things by providing characteristics of both that point out their mutual *similarities* and *differences*

Conclude

State a logical end based on reasoning and/or evidence

Criticize

Point out the *merits* and *demerits* of an item or issue

Define

Provide the essential qualities or meaning of a word or concept; make distinct and clear by marking out the limits

Describe

Give a written account or represent the characteristics of something by a figure, model, or picture

Design/Plan

Construct a plan, i.e., a detailed sequence of actions, for a specific purpose

Discuss

The word “discuss” will not be used as a directing word on math and science diploma examinations because it is not used consistently to mean a single activity

Enumerate

Specify one by one or list in concise form and according to some order

Evaluate

Give the significance or worth of something by identifying the good and bad points or the advantages and disadvantages

Explain

Make clear what is not immediately obvious or entirely known; give the cause of or reason for; make known in detail

How

Show in what manner or way, with what meaning

Hypothesize

Form a tentative proposition intended as a possible explanation for an observed phenomenon; i.e., a possible cause for a specific effect. The proposition should be testable logically and/or empirically



Identify

Recognize and select as having the characteristics of something

Illustrate

Make clear by giving an example. The form of the example must be specified in the question; i.e., word description, sketch, or diagram

Infer

Form a generalization from sample data; arrive at a conclusion by reasoning from evidence

Interpret

Tell the meaning of something, present information in a new form that adds meaning to the original data

Justify/Show How

Show reasons for or give facts that support a position

Outline

Give, in an organized fashion, the essential parts of something. The form of the outline must be specified in the question; i.e., lists, flow charts, concept maps

Predict

Tell in advance on the basis of empirical evidence and/or logic

Prove

Establish the truth, validity, or genuineness of something by giving factual evidence or logical reasons

Relate

Show logical or causal connection between things

Solve

Give a solution for a problem; i.e., an explanation in words and/or numbers

Summarize

Give a brief account of the main points

Trace

Give a step-by-step description of the development

Why

Show the cause, reason, or purpose

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